

Daily and school physical activity of 16 year-old girls and boys

Dzienna i szkolna aktywność fizyczna 16-letnich dziewcząt i chłopców

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Abstract

The aim of the paper was to determine the relationship between the school and all-day physical activity of 16-year-old girls and boys on the basis of weekly monitoring using pedometers. The study also took into account the level of all-day and school physical activity of students who were less and more active before classes. 169 people were surveyed, including 93 girls and 76 boys from upper secondary schools in the Silesia region. The respondents wore a pedometer for 5 school days recording the number of steps performed in particular parts of the day (time before school classes, time at school and time after school) in specially prepared tables.

The results showed that girls are more active in terms of the number of steps performed on school days than boys. Girls and boys meet the school's recommendation of 3000 steps. However, a difference in physical activity was observed, taking into account the division of the respondents into less and more active ones in the time before school classes. Students who are less active in terms of the number of steps taken before the start of classes at school, do not meet the school recommendation for physical activity.

It is necessary to look for physical activity reserves throughout the whole day. In addition to physical education lessons, the school should promote activity during breaks, exercises between classes, or encourage active mobility before and after school classes. Encouraging an increased number of walks, active transport to/from school, cycling, inline skating among children and young people is an important element in preparing for lifelong activity and a healthy lifestyle.

Keywords: pedometer, mobility, 11 000 steps, 3000 steps

Introduction

One of the tasks of physical education is to develop a habit of regular participation in the physical activity of students, which will be conducive to maintaining health and physical fitness in adult life. School physical activity is a significant part of the daily and weekly physical activity of children and young people. It is not only a physical education lesson, but also time spent during other subject lessons, during breaks, as well as during commuting to school or coming home after school classes [1]. School physical activity is necessary during long hours spent in a sitting position or during the increased mental strain that

accompanies students during lessons [2]. Therefore, looking for changes in the organisation of the education process, where there will be an opportunity to increase physical activity, both in terms of volume and intensity of efforts, becomes a challenge in today's education.

Recommendations for the volume of physical activity indicated, among others, by Tudor-Locke et al. [3] in the amount of 11 000 steps per day are not followed by most young people, especially at weekends [4]. Another recommendation concerning participation in 60-minute daily physical activity [5] is also difficult to implement, especially on days when there is no physical education in the timetable [6]. Out of 60 minutes of daily physical activity, 30 active minutes should be for the time spent at school [7,8], another 30 for free time after school [9]. Such a strategy will allow to increase physical activity of children and

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youth during school days [9]. A physical education lesson is not included in the schedule every day, so organising an active 30 minutes at school on all working days is a challenge. Popularization of active movement, active commuting to/from school (walking, cycling) is a suggestion in increasing the all-day physical activity [10]. Unfortunately, in recent decades, the percentage of students walking, commuting to and from school on bicycles has decreased dramatically, which is connected with the increase in the number of students transported by motor vehicles [11, 12]. The studies also show that children participating in active movement to and from school are more active compared to children brought to school [13].

Recommendations for school physical activity proposed by scientists from the Czech Republic and Poland become a goal in today's education, which the school should strive to achieve in order to ensure a balance between school time spent passively and actively. A student should perform at least 500 steps during an hour at school (i.e. about 3 000 steps during classes at school on a single day), take part in moderate to high intensity activities for at least 20 minutes a day, and there should be at least one high intensity episode of physical activity during physical education or other active form of school activity. In addition, school physical activity by volume should account for 25% of the total time a student spends at school, and at least 50% of the total time of all breaks between classes should be physically active. During the 10-minute break, a student should take 250 steps and a 20-minute break – 500 steps [14].

Looking for the relationship between school and all-day physical activity is necessary. The aim of the study presented in the article was to diagnose the daily and school physical activity of young people, taking into account the recommendation of 11 000 steps within and 3 000 steps in school. The paper also analyses school activity, taking into account students who were less and more active in the time before classes at school by making a division based on the median number of the taken steps.

Material and study methods

The research was carried out in randomly selected secondary schools in Upper Silesia in the period from September 2015 to March 2016. The study was based on weekly monitoring using Yamax SW-700 pedometers. 215 people were tested, of whom 169 were qualified for the study. The results of the others did not meet the requirements set out before the start of the study (e.g. missing or incomplete recording of the number of steps in specially prepared sheet of papers). 169 subjects were 93 girls (aged 16.45 years old \pm 0.81; body height 165.34 cm \pm 5.99; body weight 56.15 kg \pm 13.20) and 76 boys (aged 16.35 years old \pm 0.84; body height 176.06 cm \pm 8.05; body weight 67.01 kg \pm 12.22).

In order to analyse physical activity, the group of subjects was divided into less and more active before classes at school. The division was made on the basis of the median calculated from

the number of steps taken before classes at school.

Organisation of research

Before the research, a meeting with the school principal took place, at which the research assumptions were presented. The next stage was a meeting with students to encourage them to participate in the study. The students also received a letter to their parents asking for permission to participate in the research. During the next meeting with the students, pedometers and cards for recording the daily number of steps divided into segments of the day were distributed (time before school classes, classes at school with indication of PE lessons, breaks and time after school). The students wore the pedometer for a week, and made daily entries on the sheet. By programming individual data regarding stride length (\pm 1cm) and body weight (\pm 1kg), energy expenditure (kcal) and distance travelled (km) were also recorded. The students put on the pedometer every morning and took it off when they went to bed.

After a week of monitoring, the pedometers and sheets were collected, results were statistically prepared, provided to the students and discussed in terms of implementation of physical activity recommendations. For the purposes of this article, only the results obtained from monitoring school days were taken into account, excluding the weekend.

The collected data was analysed in the SPSS 17.0 statistical program. On their basis, arithmetic means (M), standard deviations (SD) were calculated, the limit of variation (minimum/maximum), median (Mdn) were recorded, analysis of variance (ANOVA) was used.

Results

Daily physical activity of girls and boys

The recommendation of daily physical activity recommended in the number of 11 000 steps [3] was met only on two school days – Thursday and Friday by girls. On other days, girls and boys reached over 10 000 steps. Detailed statistical analysis showed significant differences between individual days ($F = 4.02$ for $p = 0.003$). On Friday, on the most active day, an additional statistical difference was noted between girls and boys ($p = 0.029$). Girls turned out to be more active than boys (Fig. 1).

Activity analysis on school days, taking into account the division into less and more active girls and boys, showed statistical differences between boys and girls ($F = 13,120$ for $p = 0.000$) and between days ($F = 3.974$ for $p = 0.003$). The largest differences in physical activity occurs in a group of boys. The day when the difference is the largest (3559 steps) is Friday. Boys who were more active before school were also more active throughout the day compared to boys who showed lower activity before school. On the other hand, Monday is such a day in a group of girls. Active girls take 1737 more steps throughout the day compared

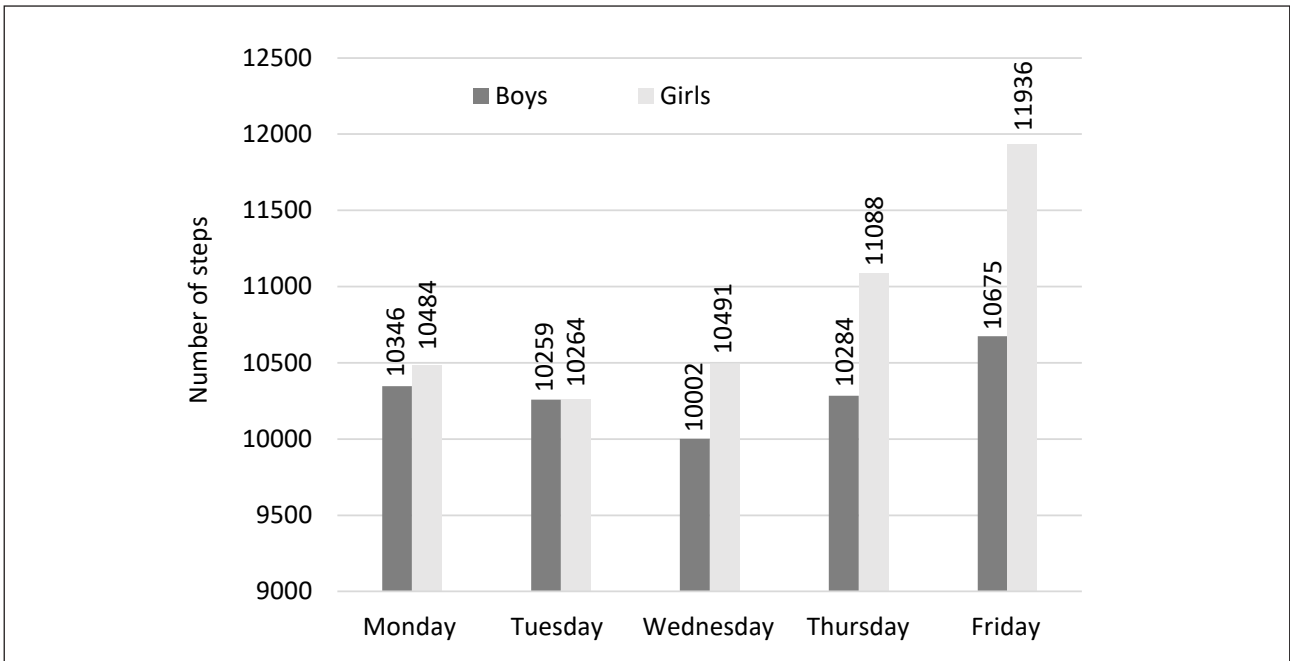


Figure 1. Number of steps taken by students on individual school days

to less active girls before school. On each day of the week, it was found that girls from the less active group were more active than boys from the less active group before school. Boys and girls representing a group with less morning activity (before school duties) do not follow the recommendations of 11 000 steps. Less active boys do not even reach 9000 steps a day (Fig. 2).

After analysing the recommendation regarding the volume of physical activity expressed in the number of 11 000 steps, it was found that a low percentage of the students met this recommendation. Girls who are more active on almost all school

days (except Tuesday) meet the recommendation of 11 000 steps at least in 50%. The lowest percentage of those observing the recommendation are boys who are less active at school. Only by 16-29% of respondents in this group travelled 11 000 steps per day. Among the less active girls, this range is 26-60% (Fig. 3).

School physical activity

When analysing school physical activity, no statistically significant differences ($F = 0.648$ for $p = 0.422$) were observed between girls and boys (Fig. 4). The results indicated that both boys

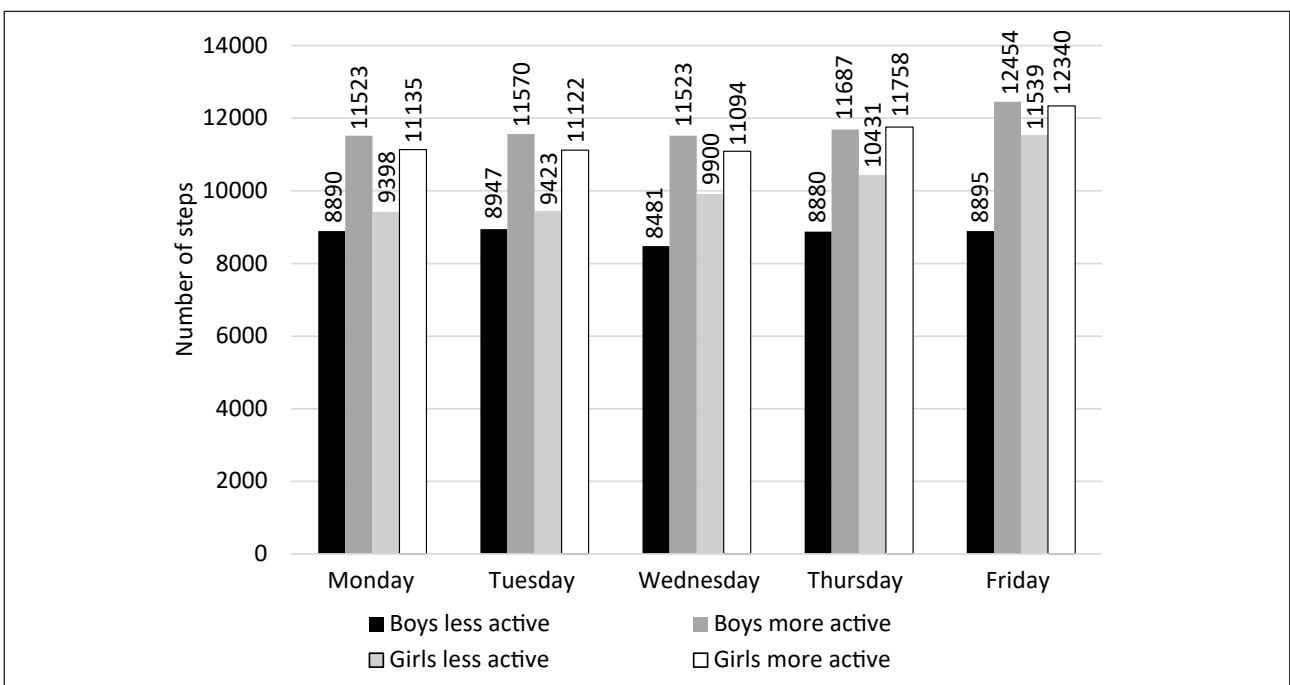


Figure 2. Daily number of steps taken by less and more active students before classes at school

and girls met the standard of 3 000 steps while in school. Students showed the greatest activity on Tuesday (Fig. 4).

However, when analysing the school physical activity of the surveyed girls and boys divided into less and more active ones, a statistically significant difference ($F = 93.025$ for $p = 0.000$) was found in the activity between boys and girls. The students who are more active before classes at school are also more active than the respondents who represent a lower level of activity during morning classes. More active boys and girls take many

Physical activity is an important element for maintaining physical and mental health as well as for proper child development. Physical activity during childhood and youth increases the likelihood of continuing it in the future in order to maintain good health as long as possible. Searching for a way to increase physical activity, especially among girls, is one of the main goals of physical culture research. Most of the research indicate that boys are more physically active than girls [15–17]. Girls are also less physically active at school compared to boys and spend more

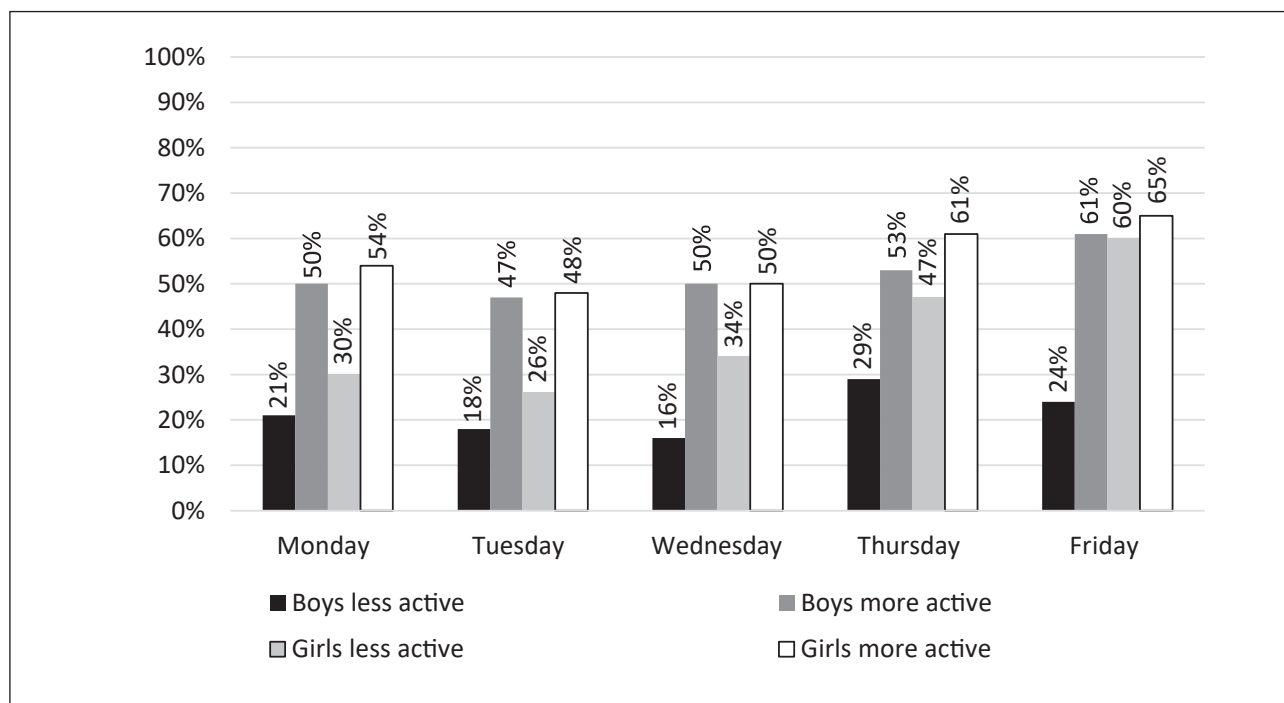


Figure 3. Percentage of students who meet the recommendations of 11 000 steps on school days depending on the morning activity before classes at school

more steps at school than recommended (3000 steps). More active boys every day reach a value of over 4000 steps, more active girls do so too, with the exception of Wednesdays (3932 steps). Less active groups do not reach 3000 steps during classes at school.

The differences in school activity between less and more active people before classes at school are large. For example, in the group of less and more active boys, the largest differences in physical activity were observed on Tuesday – 2287 steps. On the other hand, among girls, the biggest difference in activity between them was recorded on Monday – 2117 steps (Fig. 5).

Discussion

The problem of overly low physical activity appears all over the world. It applies not only to children and youth, but also to adults. It results from the lifestyle that people choose. Increasingly more people lead a passive, sedentary lifestyle. The development of modern technologies replaces human physical work. Changing sedentary life to an active one is necessary for human.

time in a seated position [18]. It all depends on the research and choice of forms as well as the intensity of efforts undertaken by girls and boys. By comparing the number of steps taken on school days, the results of the study presented in the work prove that girls are more active than boys. Especially Friday turned out to be the most active day for girls. The recommended 3000 steps during classes at school are taken by both girls and boys. There were no statistically significant differences between girls and boys in this case. It is related to the type of exercise that girls choose. It is known that girls prefer exercises of low intensity (walking), while boys prefer exercises of moderate and high intensity [19]. It is therefore worth considering whether walking should be more popularised among girls. If the preferred form brings health benefits then it should be used e.g. in school curricula. And travel to/from school in the form of walking, cycling, skating should be popularised, especially in conditions that allow for this type of activity.

Scientists report that the majority of children and youth do not meet the recommended daily physical activity. Only 38% of boys and 23% of girls aged 15 years old meet the recommenda-

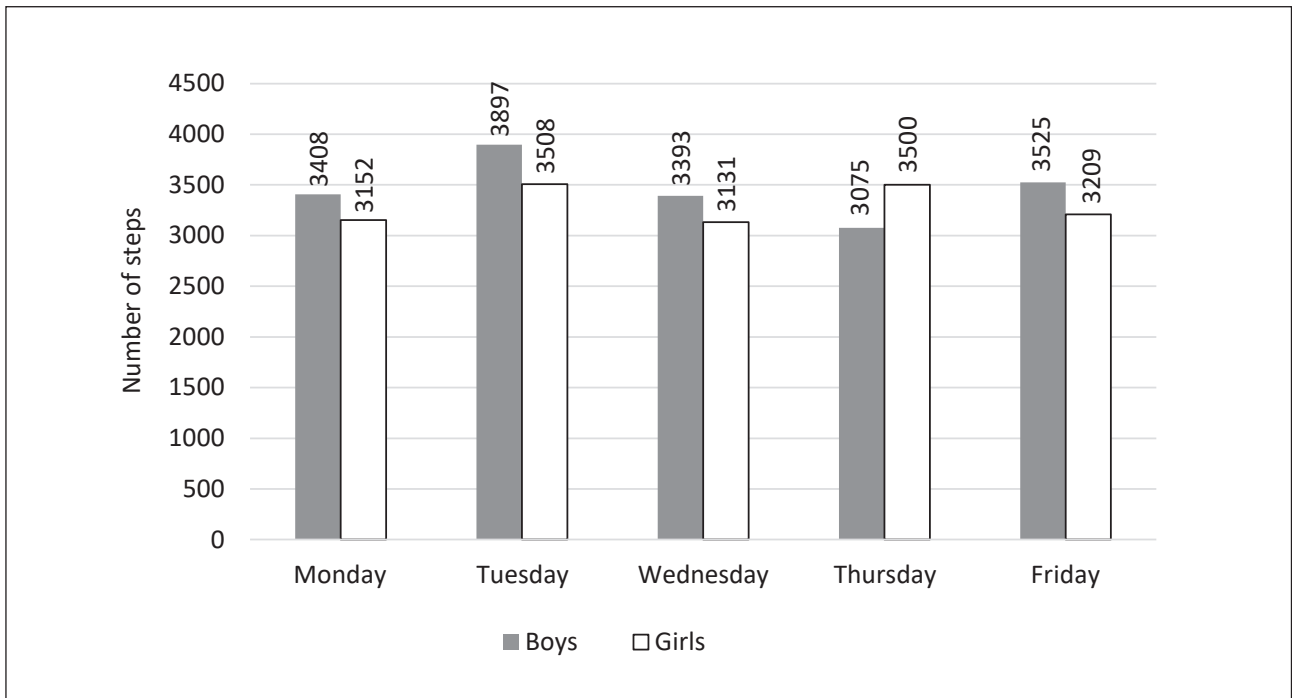


Figure 4. Physical activity at school (number of steps) of girls and boys

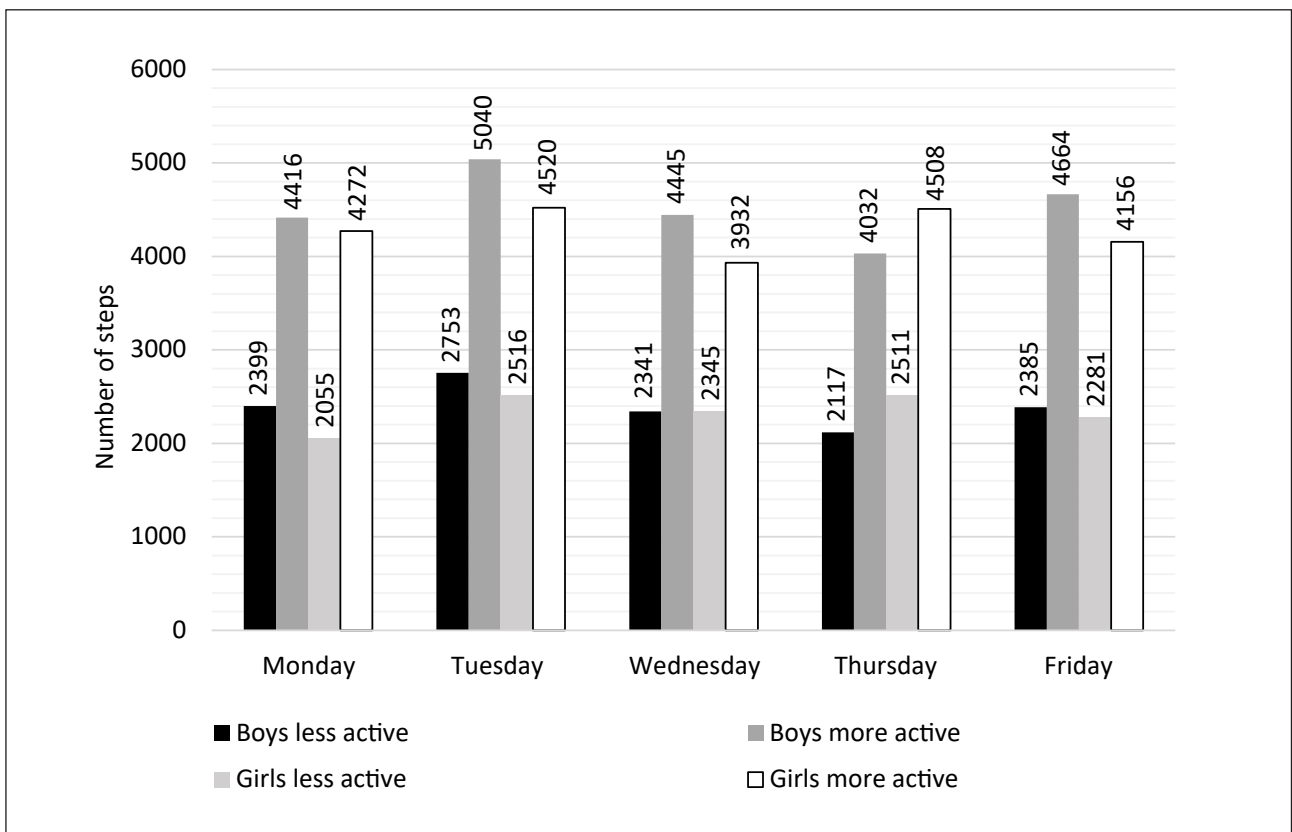


Figure 5. School physical activity expressed by the number of steps of boys and girls less and more active during the time before school

tion of physical activity for 60 minutes a day. At the age of 18, this percentage decreases to 17% among boys and 11% among girls [20]. Mota et al. [6] proved that the majority of young people hardly ever participate in physical activity in their free time.

These results provide the basis for seeking opportunities to increase physical activity among young people and indicating appropriate participation standards, including the student's stay at school. Out of 60 minutes of daily physical activity, 30 mi-

minutes should be for the time spent at school, another 30 for free time after school [9]. Active 30 minutes during school time can be completed on a day when there is a PE lesson in the lesson plan. But what about the days when there is no such lesson? The next recommendation is to take 3 000 steps during the student's stay at school [14], easy to implement on days when there is a PE lesson. What about other school days?

Once the results presented in the article are analysed, one can see the recommendation of daily school activity in the number of 3 000 steps is implemented by the surveyed girls and boys. However, when we consider the level of students' activity before school, the differences in the number of steps taken during school stay are large. Most of the less active young people do not follow the number of steps indicated, even though the time spent at school sometimes takes most of the day. Searching for time reserves in the organisation of school time seems to be justified. Unfortunately, the research presented in the paper does not include the days on which a PE lesson is included in the lesson plan, therefore their interpretation should be treated as a pilot and introduction to further detailed studies, including days with a PE lesson, activity during inter-lesson breaks, as well as continued research among greater number of students. This is the beginning of the search for the relationship between school and all-day activity.

The task for everyone responsible for the proper development of children and youth, especially parents and school, is to prepare them for physical activity throughout their lives. At school, teachers are responsible for the education process, including ensuring the right dose of movement during the student's stay at school, encouraging them to take part in free time activities, as well as during travel to/from school. A PE lesson alone will not provide students with a basic daily dose of physical activity [4,21]. Promotion of physical exercises during breaks, exercises between classes, relaxation exercises during all types of classes, active movement (mobility) or a proposal of physical activities in free time should permanently appear in the canon of school education. Such a strategy will allow to increase physical activity of children and youth during school days [9]. The proposed organised activity (e.g. by the school and other institutions) is an opportunity to increase the level of daily physical activity [22]. Unfortunately, daily or weekly physical activity of children and youth is often carried out only as part of school physical education. In addition to PE lessons, the students do not participate in other extracurricular sports and recreation forms. The problem deserves even more attention when we analyse the weekly activity of the students who for various reasons do not participate in PE lessons. These students do not experience moderate to high intensity efforts during which the heart and breathing accelerate [6].

The role of the school is therefore huge. In their research, Flynn et al. [23] prove that school curricula ensuring pro-health education together with conducted physical education lessons

contribute to increasing physical activity of children and youth as well as teach proper eating habits among students. For this reason, appropriate health programmes are created that promote more walking in everyday life. Encouraging an increased number of walks, active transport to/from school, cycling, inline skating, skateboarding among children and young people is an important element in preparing for lifelong activity and a healthy lifestyle.

Conclusions

After comparing physical activity expressed in the number of steps on school days, it was observed that on most days the subjects did not reach the recommended 11 000 steps. Only the girls on Thursday and Friday met the recommendation by exceeding the indicated number. They are also more active than boys, which is particularly evident on Friday. Analysis of the results by less and more active students in the morning before the start of school confirmed that the students taking more steps in this period of time are more active throughout the day than the students whose morning mobility is lower. In addition, the students that are more active before school met the recommended 11 000 steps on each day studied. A similar situation was observed during school stay. The students presenting a lower level of physical activity volume before school did not meet the recommended 3000 steps during their stay at school. The students who preferred active mobility before school met their school recommendation. The results of the research indicate that the popularisation of pedestrian mobility to school ensures the implementation of the daily recommendation of 11 000 steps.

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Streszczenie

Celem pracy było określenie zależności pomiędzy szkolną a całodziwną aktywnością fizyczną 16-letnich dziewcząt i chłopców na podstawie tygodniowego monitoringu z wykorzystaniem krokomierzy. W badaniu uwzględniono również poziom całodziwniej i szkolnej aktywności fizycznej uczniów mniej i bardziej aktywnych w czasie przed zajęciami w szkole. Przebadano 169 osób, w tym 93 dziewczęta i 76 chłopców ze szkół ponadgimnazjalnych regionu śląskiego. Badani nosili krokomierz przez 5 dni szkolnych zapisując liczbę wykonanych kroków w poszczególnych segmentach dnia (czas przed zajęciami w szkole, zajęcia w szkole i czas po zakończeniu zajęć w szkole) w specjalnie przygotowanych tabelach.

Wyniki badań wskazały, że dziewczęta są bardziej aktywne pod względem liczby wykonywanych kroków w dni szkolne od chłopców. Dziewczęta i chłopcy spełniają rekomendację szkolnej liczby kroków w wymiarze 3000. Zaobserwowano natomiast różnicę w aktywności fizycznej uwzględniając podział badanych na mniej i bardziej aktywnych w czasie przed zajęciami szkolnymi. Uczniowie mniej aktywni pod względem liczby kroków wykonanych przed rozpoczęciem zajęć w szkole nie spełniają zalecanej szkolnej rekomendacji aktywności fizycznej.

Poszukiwanie rezerw aktywności fizycznej w całym dniu jest konieczne. Oprócz lekcji wychowania fizycznego szkoła powinna popularyzować aktywność podczas przerw międzylekcyjnych, ćwiczeń śródlekcyjnych, czy też zachęcać do aktywnej lokomocji przed i po zajęciach w szkole. Zachęcanie do zwiększonej liczby spacerów, aktywnego transportu do/ze szkoły, jazdy na rowerze, łyżworolkach wśród dzieci i młodzież jest ważnym elementem w przygotowaniu do całodziwniej aktywności i zdrowego stylu życia.

Słowa kluczowe: krokomierz, lokomocja, 11 000 kroków, 3000 kroków
